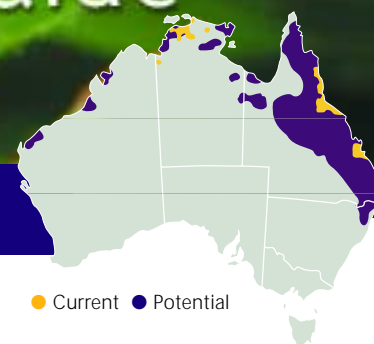


Weed Management Guide

Hymenachne or Olive hymenachne –
Hymenachne amplexicaulis



Hymenachne or Olive hymenachne (*Hymenachne amplexicaulis*)

The problem

Hymenachne is a *Weed of National Significance*. It is regarded as one of the worst weeds in Australia because of its invasiveness, potential for spread, and economic and environmental impacts.

Hymenachne is a semi-aquatic grass that was introduced as fodder in ponded pastures of central Queensland. It was subsequently planted in tropical wetlands of northern Queensland and the Northern Territory, and has since escaped from cultivation and seriously threatens northern wetlands.

Hymenachne invades permanent water bodies and seasonally inundated wetlands. It blocks waterways, potentially causing flooding and threatening drinking water.

It infests and blocks drainage and irrigation channels used for sugar cane and contaminates sugar cane crops. Fish habitat and nursery areas are also at risk.

Hymenachne forms dense stands that reduce plant diversity and available habitat for native animals. It can also affect water quality. The potential exists to severely detract from the high conservation and tourism value of natural wetland systems (eg Kakadu National Park).

The weed

Hymenachne is a perennial, robust grass to 2.5 m tall. It can grow above or below water, with its roots in the ground. Although its stems float, they are not hollow and contain white pith. The

stems can form stolons that run along the ground and produce new plants by rooting at the nodes (the joints between sections).

It has long leaves (100–450 mm) and the leaf base may be up to 30 mm wide and covered with long hairs. The upper part of the leaf is narrower and without hairs. The leaf blade is heart-shaped at its base where it clasps around the stem – this is a key characteristic of this species.

Flowers occur as a cylindrical cluster (200–400 mm long) at the end of a spike that is occasionally branched. The flower cluster is made up of numerous spikelets that are short stalked, 3–5 mm long and broadest below the middle (lance-shaped).

Key points

- Previously promoted as pasture, hymenachne is now a serious environmental and crop weed.
- It invades tropical wetlands and waterways and threatens large areas of northern Australia, including national parks, sugar cane plantations and water reservoirs.
- It is a prolific seeder and is also easily spread by plant parts.
- Catchments that are free of hymenachne should be protected from infestation.
- Control is difficult and costly, and is mainly achieved using repeated doses of herbicides.
- Other management techniques, such as burning or hard grazing before flooding, will help control it.



Hymenachne spreads by both seeds and vegetation and quickly takes over wetlands: Harrison Dam near Darwin, NT.

Photo: Colin G. Wilson

Growth calendar

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flowering				■	■	■			■	■	■	■
Seed formation				■	■	■	■	■	■	■	■	■
Seed drop				■	■	■	■	■	■	■	■	■
Germination	■	■	■	■	■	■	■	■	■	■	■	■

■ General pattern of growth in Queensland
 ■ Exceptional growth pattern in very wet years

Germination can take place all year round. On land hymenachne seeds require contact with waterlogged, or at least moist, soil for 48 hours before germination can take place. In northern Australia most rainfall occurs between November and March, and this is the most likely time for germination. However, seed also survives in water and germinates when water levels recede during the dry season.

In Queensland hymenachne flowers between April and June, although it can also flower between September and March during unusually wet years. Flowering is triggered when day length decreases to less than 12 hours. Seed is set from late autumn to early spring each year in Queensland. In the Northern Territory the flowering and seeding seasons occur one or two months earlier.

As hymenachne is a perennial, the shoots can brown off if conditions become dry and regrow during the wet season.

How it spreads

Hymenachne reproduces from both seed and broken stem fragments. It produces large numbers of viable seeds – one study reports 98% viability of seed – some of which are still viable after storage at room temperature (20–30°C) for 16 months. Graziers have reported good germination of hymenachne simply by throwing seeds into ponds.

Seed is transported downstream during annual flooding, and can also be spread in mud attached to animals. It is thought that waterbirds, particularly magpie geese (*Anseranas semipalmata*), either spread the seed in their droppings or transport seed or fragments on their bodies, as infestations have been discovered at remote magpie geese feeding grounds which are not routinely visited by people.



Hymenachne threatens conservation areas, such as Djukbinj National Park, NT.
Photo: Colin G. Wilson



Leaves clasp completely around the stem.
Photo: Colin G. Wilson

Graziers also spread hymenachne with stem fragments. Only a small piece of mature grass is required, with a minimum of two nodes either planted in mud or simply placed in shallow water. Under natural conditions floods break off segments and spread them large distances downstream.

Use in ponded pastures

Hymenachne was first imported into Australia in the 1970s, with the aim of using it in ponded pastures too deep for para grass (*Brachiaria mutica*). Ponded pastures are used to provide stock feed during the dry season when other sources of protein have been used up. Ultimately approved for release in Queensland in August 1988, it was quickly taken up by landholders and used to further stimulate ponded pasture development throughout coastal northern Queensland.

Hymenachne escaped cultivation within a few years of being released. By 1997 dozens of infestations were reported in sugar cane growing country, particularly low-lying cane plantations and drainage ditches throughout the wet tropics of Queensland, as far south as Ayr (some 80 km south of Townsville). In 2000 the total area of infestation in Queensland was estimated to be at least 1000 ha.

Hymenachne has also been planted as a pasture grass in some patches of the Northern Territory, particularly the Adelaide, Daly, Finnis and Mary rivers floodplains, and at Arafura Swamp in northern central Arnhem Land. Infestations have developed throughout these catchments and in important conservation areas including the Mary River and Kakadu national parks, and at Murganella (Cobourg Peninsula).

Where it grows

As a semi-aquatic grass, hymenachne thrives best on clay soils that are inundated during the wet season rains but dry out to some extent in the dry season. The subsoil must remain moist during the dry season, as hymenachne can only withstand short periods of drought. Consequently, it is found mainly in low-lying areas along the edges of permanent water.

Hymenachne can withstand prolonged (40 weeks) flooding by growing above floodwaters. Because it grows so rapidly, it flourishes in wetlands that receive sediment and nutrient-rich water, and it may be a good indicator of such pollution. However, it does not tolerate brackish water and does not grow well in shaded areas.

Hymenachne is native to tropical regions of South and Central America. It is a serious weed in Trinidad (West Indies), Florida (United States) and Surinam.



Hymenachne thrives on seasonally inundated wetlands: Mary River, east of Darwin, NT. Photo: Colin G. Wilson

Potential distribution

Based on climate, hymenachne could potentially occur in all seasonally flooded tropical wetlands, including the Kimberley Ranges and the central coastal region of Western Australia, the Top End of the Northern Territory and most of eastern coastal and central Queensland.

What to do about it

Use alternative pasture species where available

A native species of hymenachne, *Hymenachne acutigluma*, a perennial grass found throughout northern wetlands, is palatable to stock. In fact, in the Top End in the late 1970s buffalo ate so much native hymenachne that there was concern that it would become extinct. However, it regenerated successfully following a buffalo eradication campaign.

It has relatively similar environmental requirements to Olive hymenachne but is less tolerant of cool weather, which is the probable cause of the failure of native hymenachne plantings south of Mackay in Queensland.

Native hymenachne is used as dry season fodder, especially in the Northern Territory, where it is more abundant than in Queensland. It is also being used with other native grasses for revegetation following mimosa control. It is difficult to propagate though, and has been generally overlooked in favour of robust exotics that grow larger and faster and are more readily available. Given the detrimental impacts of Olive hymenachne, available native hymenachne pasture must be preserved and carefully managed. The potential for expanding the use of native hymenachne in pastures instead of Olive hymenachne deserves further investigation.



Native hymenachne (*Hymenachne acutigluma*) lacks the heart-shaped clasp at the leaf base and flowers later in the year than Olive hymenachne. Photo: Arthur Cameron

Threats posed by hymenachne

There are numerous economic and environmental threats posed by hymenachne. For example, it can have severe impacts on the sugar cane industry by contaminating crops and infesting drainage and irrigation channels. In one case an infestation in a cane crop caused a halving in the price of the sugar. The Queensland sugar industry is estimated to be worth \$2 billion per year.

In June 2001 the Queensland Government released its 'Policy for development and use of ponded pastures', recommending against the use of hymenachne, para grass or aleman grass (another introduced pasture grass) in ponded pastures. Similarly, the Northern Territory Government no longer recommends hymenachne for pasture. The environmental threats posed by the weed are considered too great.

The environmental threats posed to wetlands by hymenachne are also severe, as it completely replaces other species. It is also important to recognise the close ties between the environment and the economy. For example, tourism, which generates \$30 million annually in Kakadu National Park, is heavily reliant on the appeal of 'untouched' wilderness. Similarly, the potential loss of natural wildlife resources (such as fish and waterfowl) to indigenous people is an impact that has both environmental and economic consequences.

Weed control contacts

State / Territory	Department	Phone	Email	Website
NSW	NSW Agriculture	1800 680 244	weeds@agric.nsw.gov.au	www.agric.nsw.gov.au
NT	Dept of Infrastructure, Planning and Environment	(08) 8999 5511	weedinfo.ipe@nt.gov.au	www.nt.gov.au
Qld	Dept of Natural Resources and Mines	(07) 3896 3111	enquiries@nrm.qld.gov.au	www.nrm.qld.gov.au
WA	Dept of Agriculture	(08) 9368 3333	enquiries@agric.wa.gov.au	www.agric.wa.gov.au
Australia wide	Australian Pesticides and Veterinary Medicines Authority	(02) 6272 5852	contact@apvma.gov.au	www.apvma.gov.au

When using herbicides always read the label and follow instructions carefully. Particular care should be taken when using herbicides near waterways because rainfall running off the land into waterways can carry herbicides with it. Permits from state or territory Environment Protection Authorities may be required if herbicides are to be sprayed directly onto water.



(Left) Beatrice Lagoon, NT, a species-rich wetland in June 1986. (Right) Beatrice Lagoon, NT, a hymenachne monoculture in July 1995.
Photo: Colin G. Wilson

Prevention of spread

The most cost-effective way of dealing with any weed is to prevent its introduction. However, hymenachne has been actively planted throughout suitable habitat. Therefore, the main aim of hymenachne management is preventing its spread into uninfested catchments. This is a difficult task because the main agents of spread – floodwaters and probably waterfowl – are virtually impossible to control. The exclusion of hymenachne will require a policy of regular monitoring of 'at-risk' catchments and the ability to eradicate any small infestations.

Identification and monitoring of 'at-risk' catchments

Hymenachne threatens remote northern wetlands in Cape York, the Gulf of Carpentaria, the Top End and the Kimberley Ranges. The extent of para grass infestation offers a general indication of how widespread hymenachne may become, as the two species have broadly

similar environmental requirements. Para grass was estimated to cover 100,000 ha of Queensland in 1990, and 40,000 ha of the Northern Territory in 1997. The monitoring of such large, remote, inaccessible areas is a significant challenge in hymenachne management.

Controlling infestations with chemical control

There are several herbicides currently used in Queensland to control hymenachne which have been approved for use under 'off-label' minor use permits until 2004. A variety of application methods can be used, including spraying by hand, boom or helicopter. Spraying must be repeated about every three months to control regrowth. Contact your state/territory weed management agency (see table above) or local council for more information on what herbicides are registered to control hymenachne and the best application methods and dosages. The Australian Pesticides and Veterinary Medicines Authority hosts

the PUBCRIS database, which contains information on all herbicides that are registered for use on weeds in each Australian state and territory.

Mechanical or physical removal

Mechanical or physical removal will not eradicate hymenachne because of its ability to reproduce vegetatively from very small pieces. For example, a mechanical harvester has removed hymenachne and other aquatic weeds such as water hyacinth (*Eichhornia crassipes*) in deeper waters in the Burdekin Shire in Queensland, but this requires ongoing control efforts on a monthly basis.

Land management

Consumption by cattle will not kill entire plants. Indeed, in South America hymenachne is well known for its ability to withstand heavy grazing. Note that cattle can potentially spread plant segments in their hooves, or seed in mud attached to their bodies.

Flooding offers some control. It is most effective when above-ground vegetation has recently been removed, making it impossible for the hymenachne to keep up with rising water levels. Cattle, and sometimes fire, are used to remove vegetation before the wet season in the Northern Territory, although the effect of fire on non-target species must also be considered. Any regrowth weakened but not killed is more susceptible to herbicidal follow-up.



Hymenachne control in Hinchinbrook Shire, northern Queensland

Hymenachne infests all the major water bodies of Hinchinbrook Shire, north of Townsville. It has impacts on most local industries, blocking sugar cane drainage canals, reducing the tourist potential of conservation areas, preventing water extraction in horticultural areas and destroying fish habitat.

The Hinchinbrook Shire Council, concerned about the weed's impacts, commenced a project to map hymenachne throughout the region's wetlands and waterways. The location of infestations was recorded on a global positioning system and this information was then mapped onto a geographic information system. This map showed that hymenachne covered some 1200 ha and indicated suitable areas for priority control (eg infestations in upper catchments).

Under the National Weeds Program administered by the Commonwealth Government's Natural Heritage Trust, the shire gained funding to control hymenachne in 2002.

One of the first successes of the project was to gain a permit for 'off-label' aerial spraying of a suitable herbicide, which

is crucial to controlling hymenachne in large infestations that cannot be sprayed from vehicles or boats. The permit application was supported by many groups, including Herbert District Cane Growers, the Herbert River Catchment Group, Hinchinbrook Landcare, Sunfish Queensland, Nufarm and state and federal politicians.

The project trialled several different control techniques, including helicopter and land-based spraying and controlled burns, and actively sought assistance from landholders. Infestations in upper catchments were targeted for control, particularly in the Palm Creek and Cattle Creek systems.

Hymenachne has proven to be difficult to eradicate. The first treatments were applied late in the year to a blanket of germinated seedlings following rain. Once this first flush of vegetation was killed, another emerged after six to eight weeks, requiring another spray. This cycle was repeated once or twice more until autumn, with the aim of killing the hymenachne before it set seed. Although relatively easy to kill in shallow water, it is more resilient in deep water, as only



Hymenachne (*front*) threatens sugar cane crops (*rear*) in Palm Creek in Hinchinbrook Shire, Qld. Photo: Matthew Buckman

a relatively small number of leaves come in contact with the herbicide.

If no more seed or vegetation enters the area, treatment in the second and following years should be much easier. However, there is much more work that needs to be done, especially in parts of the lower catchment, which could not be treated due to lack of funds. The future of the project, and the health of key wetlands, depends on the availability of external funding and continued support of the council, landholders and other stakeholders.

Other control techniques

'Solar sheeting' or solarisation, ie covering infestations with dark plastic, can kill small outbreaks of hymenachne. Shading by tall vegetation has been investigated as a way of reducing the amount of plant material infesting rivers and creeks. This can offer long-term, cost-effective weed control and is considered more ecologically friendly than chemical or mechanical forms of control. However, tall vegetation is not likely to become established in seasonally inundated floodplains, and would have its own impacts on such systems.

Classic biological control is not likely, given the poor prospects of finding an

agent that will attack the introduced hymenachne but not the closely related native hymenachne or the unrelated, but economically important, sugar cane.

Legislation

Several east coast local councils have declared hymenachne a weed within their shires (eg Cairns City, Hinchinbrook Shire). In July 2003 it was declared as a Class 2 noxious weed in Queensland, meaning that landowners must take reasonable steps to ensure hymenachne is not on their property. The Northern Territory is also reviewing hymenachne's status. It is not declared as a weed in Western Australia.

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Maps: Australian Weeds Committee.

How to control hymenachne

Quick reference guide

Do not plant hymenachne

The numerous detrimental impacts of hymenachne significantly outweigh any benefits. It should not be planted as a pasture grass. Where appropriate, alternative pastures should be used.

Prevent its spread into uninfested catchments

Preventing the spread of hymenachne into catchments at risk of infestation is a management priority. The prevention of spread is made extremely difficult when hymenachne is present in pastures in upper catchments because it spreads downstream so easily. Additionally, waterbirds probably spread it between catchments. Therefore, monitoring of these 'at-risk' catchments, combined with the ability to eradicate small infestations, is crucial to the ecological integrity of uninfested wetlands throughout northern Queensland, the Top End of the Northern Territory, and the Kimberley and central coastal regions of Western Australia.



Aerial spraying in the Hinchinbrook Shire, Qld.
Photo: Matthew Buckman

Repeated doses of herbicides will control infestations

Control of hymenachne can be achieved. Herbicides will kill it but the application methods must be carefully tailored to the infestation characteristics. For example, in deep open water, helicopters may be required to treat infestations. Repeated treatments are required every eight weeks or so to control seedling germination during the early stages of a treatment program. Ongoing follow-up monitoring and control will be required for several years to prevent reinfestation.



Large numbers of viable seed ripen during the dry season.
Photo: Colin G. Wilson

Control options

Physical	Mechanical	Chemical	Biological
Not suited to hand removal since it reshoots from any remaining small segments.	Mechanical harvesting gives some control. Similar to mowing a lawn, as weed grows back every month and therefore requires ongoing commitment. Note: purchase cost of mechanical harvester is substantial.	Three herbicides are registered for 'off-label' minor use, using hand, boom or aerial spraying. Will require multiple treatments in the first year, then consistent follow-up in the following years. Mass die-off of weed can degrade water quality. Check with your local council or state/territory weed management agency.	No biological control agents. This control option is not thought likely given the existence of the closely related native hymenachne and the economic importance of the sugar cane industry.

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